ROI Based Compression Method for Medical Image Database

Mrs.B.Pandeeswari,N.lalitha
M.Minu,R.NagaHarini
Sethu Institute Of Technology

ABSTRACT

As the medical imaging and telemedicine has been developing on large scale. With the increasing demand of storing and sending the medical images results in lack of sufficient memory spaces and transmission bandwidth. To fix these issues compression was introduced. Over the past few years in medical imaging lossless compression schemes are under intensive interest because there is no loss of information. The only small part is more useful out of the whole image. Region of Interest Based Coding techniques are more considerable in medical field for the sake of efficient compression and transmission. The current work begins with the pre-processing of medical image. Then segmentation is applied to divide the image into two parts i.e. ROI and non ROI. Finally compression is performed to reduce the storage and network bandwidth.In this paper Fractal lossy compression for Non ROI image and Context tree weighting lossless for ROI part of an image have been proposed for the efficient compression and compared with other such as Integer wavelet transform and Scalable RBC.

1. INTRODUCTION

One of the important aspects of image deposition is its efficient and effective abbreviation. An image, 1024 pixel x 1024 pixel x 24 bit, without any abbreviation, would need approximately 4 MB of deposition space and 8 to 10 minutes for transmission, by employing a high speed, 68 Kbit/s, ISDN line. If the image is compressed at 10:1 of compression ratio, the deposition requirement is lowered to 400 KB and the transmission time comes down to below 8 seconds. Seven 2 MB images can be compressed and transferred to a floppy disk in a very less time comparatively takes to transfer one of the original files. In a distributed environment, big image files still remain a major concern within systems. Compression is an important and beneficial technique for creating file sizes of manageable and transmittable dimensions. Increasing the bandwidth is another suitable method, but due to its cost sometimes makes less attractive or demanding solution. At the existing state of technology, the only outcome is to compress multimedia data before its deposition and transmission, and de-compress it at the receiver terminal for play back. For example, with a compression ratio of 32:1, transmission time requirements, the space and bandwidth can be reduced by a factor of 32, with acceptable quality. A common characteristic feature of most of the images is that the adjoining pixels are associated and therefore consists of redundantinformation.The foremost task then is found to be less correlated representation of the image.

1.1 Different Classes Of Compression Techniques

1.1.1 Losslesscompression

Under this type of compression arrangement, the rebuilt image, after compression, is numerically similar to the real image. However lossless compression can only access a modest amount of compression. An image rebuilt following lossy compression consisting degradation relative to the real. Often this is because of the compression arrangement completely discards redundant information.

1.1.2 Lossycompression

However, lossy patterns are capable of obtaining much higher compression. Under standard regarding conditions, no visible loss is recognized (visually lossless).

The information loss in lossy coding gets from quantization of the data. Quantization can be explained as the procedure of sorting the data into various bits and representing each bit with a value. The value selected to represent a bit is called the reconstruction value. Every item in a bit has the similar reconstruction value, which leads to the information loss (unless the quantization is so fine that every item gets its own bit).

2. MEDICAL IMAGING

With the fast growing technology in image compression some researchers extracted some advantageous and fruitful methods of storing medical images digitally. They realized that number of digital data can be stored further in the computer by compressing the original data or an image so that no essential information is lost and the size gets reduced without affecting the quality of an image. They further subdivided an image into two categoriesnamely:

1. ROI (Region ofinterest)
2. Non-ROI

Medical Imaging is the technique of generating visual illustrations of the body for the medial analysis. Medical imaging uses various techniques such as MRI (magnetic resonance imaging), CT scan (computed tomography), X-ray, radiography, ultrasonography, endoscopy, electrocardiography and many more. These techniques are used to provide the area needs todiagnose.

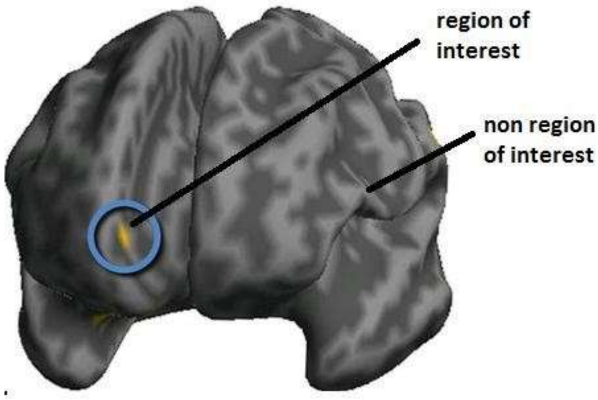

Fig 2: region of interest and non region of interest

2.1 Region of interest

All the information in a medical image is not equally important.ROI describes the affected part of an image and which has to be analyzed. This region is compressed so that reduced size of an image can be achieved with no information being lost. The ROI region is compressed using DWT (discrete wavelettransforms).

2.2 Non region ofinterest

In the process of compression the non ROI region is compressed more so that if there is any loss in information also it does not leads to anyissue.

The non region of interest region is compressed using discrete cosine transform (DCT).

3. PROPOSEDMETHOD

In this method an image has been taken and then segmented the image into region of interest (ROI) and non region of interest (non ROI) using seeded region growing method. The algorithm used to compress non ROI is discrete cosine transform and the algorithm used to compress ROI is discrete wavelet transform. After which SPIHT (Set partitioning in hierarchical trees) is applied to the wavelet. The algorithm is applied to a one dimensional image. Therefore they are reconstructed to get back the images in two dimensional. The ROI and non ROI images are combined which results in compression.

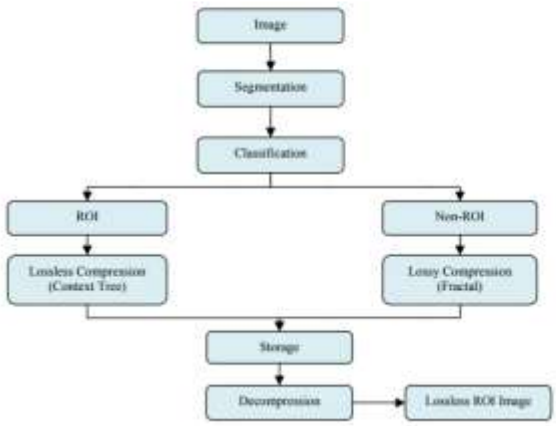

Fig:. 4 Block diagram of the proposed method

4. CALCULATIONS

In the proposed methodology the quality of an image is improved with the help of the parameters such as mean square error [MSE], peak signal to noise ratio [PSNR], compression ratio.

Mathematically these parameters are represented as:-

1. **Peak signal to noise ratio(PSNR)**

Psnr is the parameter for calculating the quality of a compressed image.

$$PSNR=10\log [i^2/MSE]$$

Where I= intensity of the image pixel level. For 5 bit per pixel, $I^5-1=31$

2. **Compressionratio**

Compression ratio=

$$\frac{\text{Number of bits required for an original image}}{\text{Number of bits required for compressed image}}$$

Implementation results

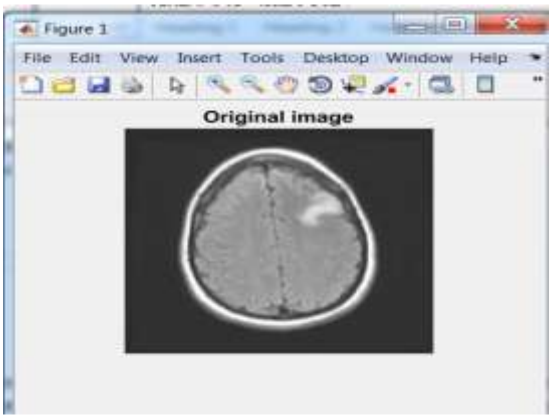

Fig input image

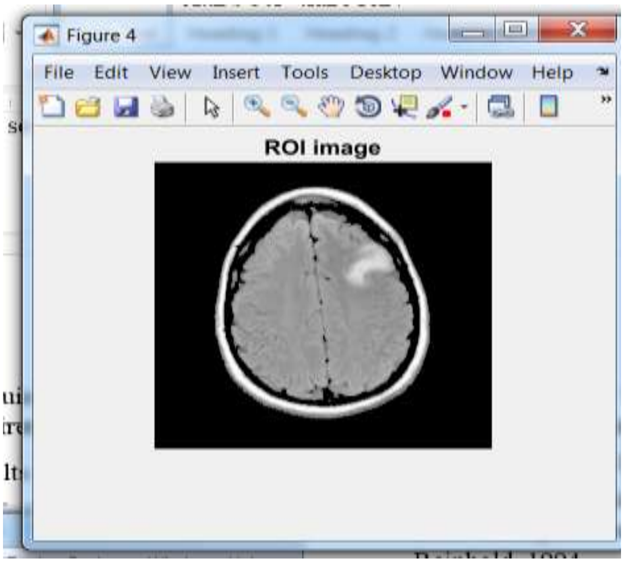

Fig roi image

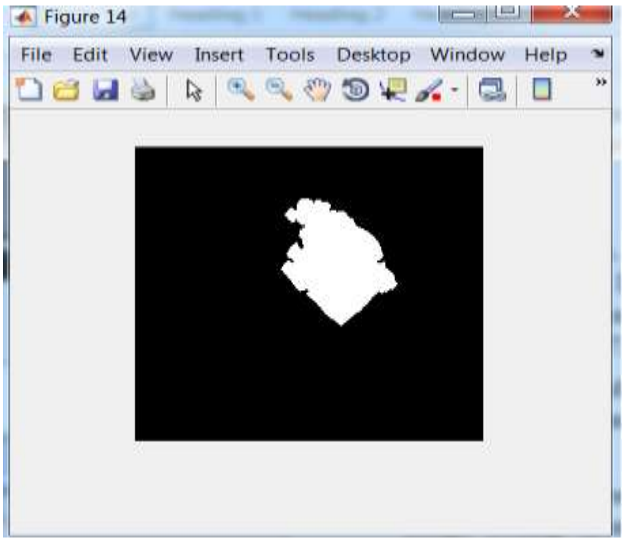

Fig segmented image

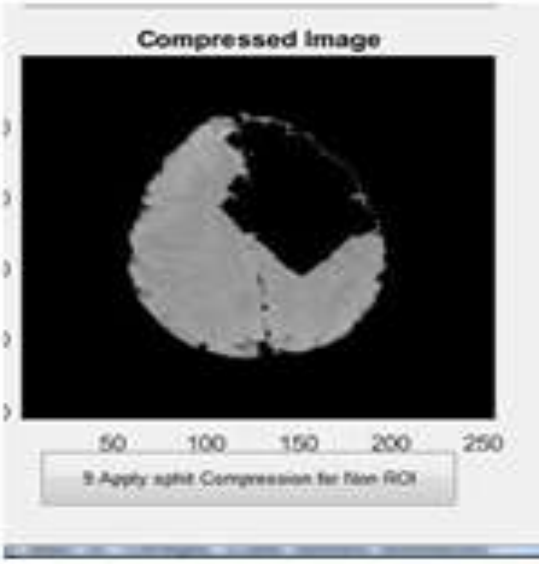

Fig reconstructed and performance analysis

7. CONCLUSION

In the paper develops the method for line dependent wavelet transforms. The paper focused on this transform that can be applicable to the encoder or the decoder and such that it can hold abbreviated form of data along with that, described highly scalable spiht coding algorithm which can operate with very less memory in addition to the combination with the line- based transform, and proved that its performance can be combative with condition of the art image coders, at a fragment of their memory utilization. where results were carried out by applying discrete wavelet transform, and the proposed work, where SPIHT is applied to DWT (ROI), and concluded that the combination of wavelet transform and SPIHT Algorithm improves the compression ratio as well as PSNRandMSE.Theworkintroducesadetailed executionof a low memory wavelet image coder. Its main significant and efficient advantage is that by making a wavelet coder that should be fair enough both in terms of speed and memory requirements.

Future enhancement

Optimization algorithm will be applied to choose a optimum seed point threshold in segmentation in order to choose best clusters

8. REFERENCES

[1] C. Chrysas and A. Ortega, Line Based Reduced Memory Wavelet Image Compression," in Proc. IEEE Data Compression Conference, (Snowbird, Utah), pp. 398{407,1998.

[2] W. Pennebaker and J. Mitchell,, JPEG Still Image Data Compression Standard. Van No strand Reinhold,1994.

[3] D. Lee, New work item proposal: JPEG2000 image coding system." ISO, IEC JTC1, SC29, WG1 N390, 1996.

[4] J. M. Shapiro, "embedded image coding using zero trees of wavelet coefficients." IEEE Trans. Signal Processing, vol. 41, pp. 3445 3462, December 1993.

[5] Habibollahdanyoli and Alfred mertins .Highly scalable image compression based on spiht for network applications

[6] Rafael C.Gonzalez, Richard E.Woods, *Digital Image Processing,* Prentice-Hall, 2002.

[7] Rafael C.Gonzalez, Richard E.Woods, Steven l.Eddins, Digital *Image Processing Using MATLAB,* Prentice-Hall, 2004.

[8] A. M. Tekalp, *Digital Video Processing*. Englewood Cliffs, NJ: Prentice-Hall,1995.

[9] M. Antonini, M. Barlaud, P. Mathieu, and I. Daubechies, "*Image coding using wavelet transform*," IEEE Trans. Image Processing, vol. 1, pp. 205–220, Apr.1992.

[10] D. Taubman and A. Zakhor, "*Multirate 3-D subband coding of video*," IEEE Trans. Image Processing, vol. 3, pp. 572–588, Sept. 1994.

[11] Rolf Adams and Leanne Bischof, "*Seeded region growing*," IEEE transactions on pattern analysis and machine intelligence, vol. 16, no. 6, June1994

[12] Mr. S.M. Kulkarni, Dr. D. S.Bormane, Dr. S.L.Nalbalwar, "*Region of interest based coding technique applied to CT and MRI images for medical image compression,"*ELSEVIER.

[13] SudeeptiDayal, Neelesh Gupta, Neetu Sharma, *"Image compression using super resolution technique-A Review,"* International Journal of Computer Applications (0975 – 8887) Volume 109 – No. 7, January2015

[14] M. Suryanarayana Murthy, "Efficient Digital Image Compression byUsingSPIHT Algorithm Combined with Huffman Encoding," International Journal of Engineering Research & Technology (IJERT), Vol. 2 Issue 12, December –2013.